CLAIMS

What is claimed is:

1   1. A method for replicating data from a master server to a slave server over
2   a network, the method comprising the steps of:
3   sending a packet of information from the master server to the
4   slave server, the information relating to a change in
5   the data stored on the master server and containing a
6   version number for the present state of the data;
7   allowing the slave server to determine whether the data on
8   the slave server has been updated to correspond to
9   the version number contained in the packet; and
10   requesting a delta be sent from the master server to the
11   slave server if the data on the slave server does not
12   correspond to the version number contained in the
13   packet, the delta containing information needed to
14   update the slave server.

1   2. A method according to claim 1, further comprising:
2   storing an original copy of the data on the master server.

1   3. A method according to claim 1, further comprising:
2   persistently caching the data on a local disk for each slave server.

1   4. A method according to claim 1, further comprising:

2   determining a unique version number for the current state of the

3   data on the master server if the data has changed.

1   5. A method for replicating data from a master server to a slave server over

2   a network, the method comprising the steps of:

3   sending a version number from the master server to the

4   slave server, the version number relating to the

5   present state of the data stored on the master server;

6   allowing the slave server to determine whether the slave

7   server has been updated to reflect the present state of

8   the data corresponding to the version number sent

9   from the master server; and

10   requesting a delta be sent from the master server to the

11   slave server if the slave server does not correspond to

12   the version number sent by the master, the delta

13   containing information needed to update the slave

14   server.

1   6. A method according to claim 5, further comprising:

2   sending the delta from the master server to the slave server.

1   7. A method according to claim 5, further comprising:

2   committing the delta to the slave server.

1 8. A method according to claim 5, further comprising:

2   updating the version number of the slave server after committing the

3   delta.

1 9. A method according to claim 5, further comprising:

2   periodically sending the version number from the master server to

3   a slave server.

1 10. A method according to claim 5, further comprising:

2   sending the version number to a slave server until the slave server

3   acknowledges receipt of the version number.

1 11. A method according to claim 5, further comprising:

2   including data with the version number that is necessary to update

3   a slave server.

1 12. A method according to claim 11, further comprising:

2   committing the data necessary to update the slave server as soon

3   as it is received.

1 13. A method according to claim 5, further comprising:

2   determining the scope of the delta before sending it from the master

3   server.

1   14.   A method for replicating data over a network including a master

2   server and at least one slave server, the method comprising the

3   steps of:

4   sending a packet of information from a master server to each

5   slave server on the network, the information relating to

6   a change in the data stored on the master server and

7   containing a current version number for the present

8   state of the data, the information further relating to

9   previous changes in the data and a version number

10   for each previous change;

11   allowing each slave server to determine whether the slave

12   server has been updated to correspond to the current

13   version number;

14   allowing each slave server to commit the information if the

15   slave server has not missed a previous change; and

16   allowing each slave server having missed a previous change

17   to request that previous change be sent from the

18   master server to the slave server before the slave

19   server commits the packet of information.

1   15. A method according to claim 14, further comprising:

2   committing the packet of information to a slave server.

1   16. A method according to claim 14, further comprising:

2   aborting the commit of the packet of information if a slave server

3   cannot commit the update.

1   17. A method according to claim 14, further comprising:

2   determining the scope of the delta before sending it from the master

3   server.

1   18. A method according to claim 14, further comprising:

2   including the scope of each the previous changes in the delta.

1   19. A method for replicating data over a network including a master server

2   and at least one slave server, the method comprising the steps of:

3   sending a packet of information from a master server to each

4   slave server on the network, the information relating to

5   a change in the data stored on the master server and

6   containing a prior version number for the prior state

7   and a new version number for the new state of the

8   data, the information further relating to previous

9   changes in the data and a previous version number

10	for each previous change;
11	allowing each slave server to determine whether the data on
12	the slave server corresponds to the prior version
13	number contained in the packet;
14	allowing each slave server to commit the packet of
15	information if the data on the slave server corresponds
16	to the prior version number contained in the packet,
17	the commit also updating the version of the slave
18	server to the new version number; and
19	allowing each slave server not corresponding to the prior
20	version number to request that a delta be sent from
21	the master server containing the information
22	necessary to update the slave to the prior version
23	number before the slave server commits the packet of
24	information.

1	20. A method for replicating data over a network including a master server
2	and at least one slave server, the method comprising the steps of:
3	sending a packet of information from a master server to each
4	slave server on the network, the information relating to
5	a change in the data stored on the master server and
6	containing a version number for the prior state and a
7	version number for the new state of the data, the

8   information further relating to previous changes in the

9   data and a version number for each previous change;

10   allowing each slave server to determine whether the data on

11   the slave server corresponds to the prior version

12   number contained in the packet;

13   allowing each slave server to commit the packet of

14   information if the data on the slave server corresponds

15   to the prior version number contained in the packet,

16   the commit also updating the version of the slave

17   server to the new version number; and

18   allowing each slave server not corresponding to the prior

19   version number to request that a delta be sent from

20   the master server containing the information

21   necessary to update the slave to the new version

22   number.

1   21. A method for replicating data from a master server to at least one slave

2   server over a network, the method comprising the steps of:

3   sending a packet of information from the master server to a

4   slave server, the information relating to a change in

5   the data stored on the master server and containing a

6   version number for the present state of the data;

7   receiving the packet of information to a slave server;

8   allowing the slave server to determine whether the slave

9   server has been updated to correspond to the version

10   number contained in the packet, and to further

11   determine whether the slave server can process the

12   packet of information if needed to update to

13   correspond to the version number contained in the

14   packet;

15   sending a signal from the slave server to the master server,

16   the signal indicating whether the slave server needs to

17   be updated and whether the slave server can process

18   the update; and

19   sending a response signal from the master server to the

20   slave server indicating whether the slave server

21   should commit to the information contained in the

22   packet; and

23   committing the packet of information to the slave server if so

24   indicated by the response signal.

1   22. A method according to claim 21, further comprising:

2   determining whether each of the at least one slave server can

3   commit the data.

1   23. A method according to claim 21, further comprising:

2   determining whether each of the at least one slave server has sent

3   a response back to the master server.

1   24. A method according to claim 21, further comprising:

2   determining whether any of the at least one slave server can commit

3   the data.

1   25. A method according to claim 21, further comprising:

2   committing the data only if each of the at least one slave server can

3   process the commit.

1   26. A method according to claim 21, further comprising:

2   aborting the data only if any of the at least one slave server cannot

3   process the commit.

1   27. A method according to claim 21, further comprising:

2   committing the data to those slaves that are able to process the

3   commit.

1   28. A method according to claim 21, further comprising:

2   multicasting the update to any of the at least one slave server that

3   were not able to process the commit.

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1   29. A method according to claim 21, further comprising:

2   heartbeating the new version number to any of the at least one

3   slave server that were not able to process the commit.

1   30. A method according to claim 21, further comprising:

2   requesting a delta be sent to a slave server that was not able to

3   process the commit.

1   31. A method for replicating data over a network, the method comprising

2   the steps of:

3   (a) determining whether the replication should be accomplished in

4   a one or two phase method;

5   (b) sending replication information determined to he accomplished

6   in a one phase method by:

7   sending a packet of information from the master server to the

8   slave server, the information relating to a change in

9   the data stored on the master server and containing a

10   version number for the present state of the data;

11   receiving the packet of information to a slave server;

12   allowing the slave server to determine whether the data on

13   the slave server has been updated to correspond to

14   the version number; and

15   requesting a delta be sent from the master server to the

16	slave server if the slave server does not correspond to
17	the version number, the delta containing information
18	needed to update the slave server;
19	(c) sending replication information determined to he accomplished
20	in a two phase method by:
21	sending a packet of information from the master server to the
22	slave server, the information relating to a change in
23	the data stored on the master server and containing a
24	version number for the present state of the data;
25	allowing the slave server to determine whether the slave
26	server has been updated to correspond to the version
27	number, and to further determine whether the slave
28	server can process the packet of information;
29	sending a signal from the slave server to the master server
30	indicating whether the slave server needs to be
31	updated and whether the slave server can process the
32	packet of information;
33	sending a response signal from the master server to the
34	slave server indicating whether the slave server
35	should commit to the packet of information; and
36	committing the packet of information to the slave server if so
37	indicated by the response signal.

1   32. A method for replicating data over a network, the method comprising

2   the steps of:

3   (a) determining whether replication should be accomplished in a one

4   or two phase method;

5   (b) sending data to be replicated in a one phase method by:

6   sending a version number for the current state of the data

7   from a master server to a slave server;

8   requesting a delta be sent from the master server to the

9   slave server if the data on the slave server does not

10   correspond to the version number; and

11   (c) sending data to be replicated in a two phase method by:

12   sending a packet of information from the master server to a

13   slave server;

14   determining whether the slave server can process the packet

15   of information; and

16   committing the packet of information to the slave server if the

17   slave server can process the packet of information.

1   33. A method for replicating data from a master to a plurality of slaves on

2   a network, the method comprising the steps of:

3   (a) determining whether replication should be accomplished in a one

4   or two phase method;

5   (b) sending data to be replicated in a one phase method by:

6   sending a version number for the current state of the data

7   from the master to each slave; and

8   requesting a delta be sent from the master to each slave

9   containing data that does not correspond to the

10   version number;

11   (c) sending data to be replicated in a two phase method by:

12   sending a packet of information from the master to each

13   slave; and

14   committing the packet of information to the slaves if each of

15   the plurality of slaves can process the packet of

16   information.

1 34. A method for replicating data from a master to a plurality of slaves on

2 a network using one and two phase methods, the method comprising the

3 steps of:

4   (a) sending data to be replicated in a one phase method by sending

5   a version number for the current state of the data from the

6   master to each slave so that each slave may request a delta

7   to be sent from the master to the slave to update the data on

8   the slave; and

9   (b) sending data to be replicated in a two phase method by sending

10   a packet of information from the master to each slave, the

11   packet of information to be committed by each slave if every

12   slave is able to commit the packet of information.

1   35. A method for replicating data on a clustered network using one and two

2   phase methods, each network cluster containing a cluster master and at

3   least one cluster slave, the method comprising the steps of:

4   (a) sending data to be replicated in a one phase method by sending

5   a version number for the current state of the data from a first

6   cluster master to all other cluster masters so the other cluster

7   masters may each request a delta; and

8   (b) sending data to be replicated in a two phase method by sending

9   a packet of information from the first cluster master to each

10   other cluster master, the packet of information to be

11   committed by the other cluster masters if the other cluster

12   masters are able to commit the packet of information.

1   36. A method according to claim 35, further comprising:

2   sending the data from each cluster master to each cluster slave in

3   the cluster with that cluster master by a one-phase method.

1   37. A method according to claim 10, further comprising:

2   sending the data from each cluster master to each cluster slave in

3   the cluster with that cluster master by a two-phase method.

1   38. A computer-readable medium, comprising:

2   (a) means for sending a packet of information from a master server

3   to each slave server on the network, the information relating

4   to a change in the data stored on the master server and

5   containing a current version number for the present state of

6   the data, the information further relating to previous changes

7   in the data and a version number for each previous change;

8   (b) means for allowing each slave server to determine whether the

9   slave server has been updated to correspond to the current

10   version number;

11   (c) means for allowing each slave server to commit the information

12   if the slave server has not missed a previous change; and

13   (d) means for allowing each slave server having missed a previous

14   change to request that previous change be sent from the

15   master server to the slave server before the slave server

16   commits the packet of information.

1   39. A computer program product for execution by a server computer for

2   replicating data over a network, comprising:

3   (a) computer code for sending a packet of information from a master

4   server to each slave server on the network, the information

5   relating to a change in the data stored on the master server

6   and containing a current version number for the present state

7	of the data, the information further relating to previous
8	changes in the data and a version number for each previous
9	change;
10	(b) computer code for allowing each slave server to determine
11	whether the slave server has been updated to correspond to
12	the current version number;
13	(c) computer code for allowing each slave server to commit the
14	information if the slave server has not missed a previous
15	change; and
16	(d) computer code for allowing each slave server having missed a
17	previous change to request that previous change be sent
18	from the master server to the slave server before the slave
19	server commits the packet of information.
1	40. A system for replicating data over a network, comprising:
2	(a) means for sending a packet of information from a master
3	server to each slave server on the network, the
4	information relating to a change in the data stored on
5	the master server and containing a current version
6	number for the present state of the data, the
7	information further relating to previous changes in the
8	data and a version number for each previous change;
9	(b) means for allowing each slave server to determine whether the

10   slave server has been updated to correspond to the current

11   version number;

12   (c) means for allowing each slave server to commit the information

13   if the slave server has not missed a previous change; and

14   (d) means for allowing each slave server having missed a previous

15   change to request that previous change be sent from the

16   master server to the slave server before the slave server

17   commits the packet of information.

1   41. A computer system comprising:

2   a processor;

3   object code executed by said processor, said object code configured

4   to:

5   (a) send a packet of information from a master server to

6   each slave server on the network, the information

7   relating to a change in the data stored on the master

8   server and containing a current version number for the

9   present state of the data, the information further

10   relating to previous changes in the data and a version

11   number for each previous change;

12   (b) allow each slave server to determine whether the slave

13   server has been updated to correspond to the current

14   version number;

15   (c) allow each slave server to commit the information if the

16   slave server has not missed a previous change; and

17   (d) allow each slave server having missed a previous change

18   to request that previous change be sent from the

19   master server to the slave server before the slave

20   server commits the packet of information.